

#### **401 KAR 6:350. Monitoring well construction practices and standards.**

RELATES TO: KRS 223.400 - 223.460, 223.991, 224.1-400, 224.1-405, 224.43-010 - 224.43-815, 224.46-012 - 224.46-870, 224.60-100 - 224.60-160

STATUTORY AUTHORITY: KRS 151.110, 223.435, 224.10-100, 224.70-100, 224.70-110

NECESSITY, FUNCTION, AND CONFORMITY: KRS 224.10-100, 224.70-100, and 224.70-110 authorize the cabinet to establish administrative regulations to protect water quality. KRS 223.435 requires the secretary of the cabinet to promulgate administrative regulations establishing standards of practice for water well construction. This administrative regulation establishes requirements for the construction of monitoring wells, including temporary monitoring wells, and provides minimum standards for location, construction, modification, and abandonment.

Section 1. General Requirements. (1) Each monitoring well shall be constructed, modified, or abandoned by a monitoring well driller or monitoring well driller assistant certified in accordance with KRS 223.425 and 401 KAR 6:320.

(2) A monitoring well driller's assistant shall work under the "direct supervision", as defined by 401 KAR 6:001(14), of a certified monitoring water well driller.

(3) Well specifications shall:

(a) Be provided by the certified well driller to the well driller's assistant, as required under "direct supervision", as defined by 401 KAR 6:001(14), for the work to be conducted including:

1. Construction;
2. Alteration;
3. Maintenance;
4. Repair;
5. Reworking;
6. Development;
7. Abandonment; or
8. Plugging; and

(b) Shall be recorded on the Uniform Kentucky Well Construction Record, which shall be:

1. Retained by the well driller's assistant; and
2. Available for inspection upon request by the cabinet.

(c) Changes made to well specifications during any work being conducted on a well shall be:

1. Approved in advance by a certified well driller;
2. Recorded on an amended Uniform Kentucky Well Construction Record;
3. Retained by the well driller's assistant; and
4. Available for inspection upon request by the cabinet.

(4) Permanent and temporary monitoring wells shall be constructed, modified, and abandoned in a manner that prevents the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(5) Reporting requirement. Within sixty (60) days after completion, modification, or abandonment of a monitoring well or temporary monitoring well, the certified monitoring well driller shall:

(a) Record all information about the depth and the materials used in the monitoring well construction, modification, or abandonment; and

(b) Submit a complete Uniform Kentucky Well Construction Record form to the cabinet and monitoring well owner.

(6) Each well constructed or modified shall be tagged with a well identification number tag provided by the cabinet.

(a) An existing well identification number shall be included on the Uniform Kentucky Well Maintenance and Plugging Record for any well being modified or abandoned.

(b) If a well identification number does not exist at the time of modification or abandonment, the well shall be tagged and the well identification number assigned shall be recorded on the Uniform Kentucky Well Maintenance and Plugging Record.

(7) Variance. If conditions exist or are believed to exist that preclude compliance with the requirements established in this administrative regulation, the certified monitoring well driller may request a variance from the cabinet prior to well construction or well abandonment.

(a) The variance request shall be submitted in writing on the Kentucky Monitoring Well Variance Request form and shall include:

1. A thorough description of the:
  - a. Land use at the site and at adjacent and surrounding properties; and
  - b. Expected geologic conditions at the site, including:
    - (i) Soil thickness;
    - (ii) Type of bedrock;
    - (iii) Depth to groundwater;
    - (iv) Perched water; and
    - (v) Confining zones;
2. Distance between the proposed monitoring well location and:
  - a. Other existing water-supply wells or monitoring wells on adjacent properties; and
  - b. Potential pollution sources, both on site and on adjacent properties, including:
    - (i) Septic systems;
    - (ii) Sewers; and
    - (iii) Petroleum and chemical storage tanks, or other potential pollution sources;
3. A summary of the provisions, including the section numbers of this administrative regulation, for which the variance is requested;
4. A justification for the variance;
5. Proposed construction, modification, or abandonment procedures to be used in lieu of compliance with this administrative regulation; and
6. An explanation of how the alternate well construction procedures will ensure the protection of the quality of the groundwater and the protection of public health and safety.

(b) Written variance procedure.

1. The certified monitoring well driller shall:
  - a. Request a variance by submitting to the cabinet a complete Kentucky Monitoring Well Variance Request form signed by the certified monitoring well driller and, if possible, by the monitoring well owner; and
  - b. Obtain cabinet approval before well construction begins.
2. The cabinet shall:
  - a. Notify the applicant in writing within ten (10) days of its decision to either grant or deny the variance; and
  - b. Not issue a variance if the proposed monitoring well construction will not ensure the protection of groundwater quality and public health and safety.

(c) Verbal variance for an emergency.

1. A certified monitoring well driller may request a verbal variance for an emergency if the delay incurred due to the written variance procedure established in paragraph (b) of this subsection may result in:

a. Failure to address an existing or impending environmental emergency in accordance with KRS 224.1-400; or

b. A risk to public health or safety.

2. The cabinet shall not issue a variance if the proposed monitoring well construction will not ensure the protection of groundwater quality and public health and safety.

3. Within fifteen (15) days of the date the cabinet approves the verbal variance for an emergency, the certified monitoring well driller shall submit to the cabinet a complete Kentucky Monitoring Well Variance Request form signed by the certified monitoring well driller and monitoring well owner.

(d) The variance approval shall list the conditions of the variance, including the:

1. Approved alternate well construction procedures;

2. Well sampling requirements; and

3. Requirement to notify surrounding property and well owners of the variance, if applicable.

(e) The certified monitoring well driller shall submit to the cabinet and the monitoring well owner a copy of the Kentucky Monitoring Well Variance Request form signed by the certified monitoring well driller and the monitoring well owner within sixty (60) days after the well is completed.

Section 2. Design Factors. Monitoring well construction shall comply with the requirements established in this section. (1) Monitoring wells shall not be constructed in an identified special flood hazard area unless:

(a) An alternate site does not exist;

(b) The well is water tight; and

1. The well is of flush mounted construction; or

2. The well casing extends a minimum of two (2) feet above the highest base flood elevation at the site.

(2) Measures shall be taken during drilling and well construction to prevent the introduction or migration of contaminants to a water-bearing zone or aquifer.

(3) Water used in the drilling or decontamination process shall be potable.

(4)(a) Each water-bearing zone that is intercepted during the drilling phase but not intended for groundwater monitoring shall be:

1. Sealed off to prevent down-hole cross contamination before advancing the borehole; and

2. Prevented from contributing to a well by installing outer casing with a watertight seal.

(b) The permanent outer casing shall have a minimum two (2) inch annulus between the:

1. Borehole and the outside diameter of the outer casing; and

2. Outer casing and the inner casing.

(c) The outer casing shall be grouted with sealing materials using a grout pipe.

(d) A minimum cure time in accordance with the sealing material manufacturer's specifications shall be required before drilling through the grout seal.

(e) Temporary outer casing may be installed.

Section 3. Monitoring Well Construction. (1) General Requirements.

(a) All permanent and temporary monitoring wells shall be constructed, modified, and abandoned in a manner that prevents the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(b) Monitoring wells shall be constructed in a manner that yields both groundwater samples and groundwater-level measurements that shall be representative of the water-bearing zone or aquifer to be monitored.

(2) Boreholes.

(a)1. Boreholes drilled in unconsolidated formations shall be a minimum of four (4) inches greater than the outside diameter of the well casing and well screen except for sonic wells, direct push wells, and temporary wells.

2. The open borehole shall be cleaned if soil or rock fall into the open borehole during auger or drill-stem retrieval.

(b) Boreholes drilled in consolidated formations shall be a minimum of two (2) inches greater than the outside diameter of the well casing and screen.

(c) Boreholes drilled by the hollow-stem auger or sonic drill method shall have a minimum auger or casing inner diameter (ID) as established in this paragraph.

1. Four and one quarter (41/4) inches ID for the installation of two (2) inch monitoring well casing;

2. Six and one quarter (61/4) inches ID for the installation of four (4) inch monitoring well casing; or

3. Larger augers shall be required if installation difficulties due to geologic conditions or greater depths are anticipated.

(3)(a) Lubricant shall not be used on drill pipe threads, hollow-stem or solid-stem augers, or on the exterior of the drill pipe, unless approved in advance by the cabinet following the variance procedure established in Section 1(7) of this administrative regulation.

(b) A request to use a lubricant shall:

1. Be submitted by the certified monitoring well driller in writing to the cabinet; and

2. Include a Safety Data Sheet for the proposed lubricant.

(4)(a) If the air rotary drilling method is used, drill cuttings shall be contained.

(b) Air rotary drills using screw compressor systems shall have a coalescing filter system that captures excess entrained compressor oils.

(5) Drilling Derived Waste (DDW) shall be properly containerized.

Section 4. Monitoring Wells Completed Below Ground Surface. (1)(a) Flush mount wells may be approved in areas where above-ground completion is not practical or poses a threat to monitoring well integrity and safety.

(b) Monitoring wells completed below ground surface shall have a flush-mount manhole with a bolt-down well cover and waterproof seals installed to prevent the inflow of surface water and contaminants.

(2) The concrete surface pad shall slope away from the monitoring well to prevent precipitation or contaminants from accumulating around the well.

(3) (a) Waterproof seals shall be installed between the cover and the box; and

(b) O-rings or gaskets shall be installed around the bolts that mount on the cover.

(4) The cover shall consist of material able to withstand the maximum expected loadings.

(5) A water-tight lockable cap shall be attached to the top of the well casing.

(6) The well casing shall be cut so that the locking cap shall install properly and provide a waterproof seal.

(7) A flush-mount monitoring well shall have a concrete surface pad that shall be a minimum of four (4) inches thick with a minimum two (2) foot diameter or square pad centered on the well.

Section 5. Direct Push Monitoring Wells. (1) Direct push monitoring wells installed using direct push technology shall be constructed, modified, and abandoned in a manner that prevents the introduction or migration of contamination to a water-bearing zone or aquifer through the

casing, drill hole, or annular materials.

(2) Temporary monitoring wells installed by the direct push method shall:

(a) Be constructed in a manner that yields both groundwater samples and groundwater level measurements that shall be representative of the water-bearing zone or aquifer to be monitored;

(b) Not allow the mixing of hydrogeologically distinct groundwater zones;

(c) Not exceed fifty (50) feet in depth unless otherwise approved by the cabinet; and

(d) Comply with requirements as established in Section 6 of this administrative regulation.

(3) Direct push monitoring wells shall also comply with the additional standards established in this subsection.

(a) The outside diameter of the borehole shall be a minimum of one (1) inch greater than the outside diameter of the well casing.

(b) Premixed bentonite slurry or bentonite chips with a minimum of one-eighth (1/8) inch diameter shall be used in the sealed interval below the static water level.

(c) 1. Direct push monitoring wells shall not be constructed through more than one (1) water-bearing formation unless the upper water bearing zone is isolated by temporary or permanent casing.

2. The direct push tool string may serve as temporary casing.

(4) Prepacked well screens may be used.

Section 6. Temporary Monitoring Wells. (1) Temporary monitoring wells shall be:

(a) Constructed, modified, and abandoned in a manner that prevents the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials; and

(b) Constructed in a manner that yields both groundwater samples and groundwater level measurements that shall be representative of the water-bearing zone or aquifer to be monitored.

(2) The annulus between the borehole and the well casing shall be sealed at the surface with a bentonite seal to prevent surface water from migrating into the borehole.

(3) Each temporary monitoring well shall be properly abandoned, as established in Section 11 of this administrative regulation, within seventy-two (72) hours after the well was constructed.

(4) A record of a temporary monitoring well constructed and abandoned shall be submitted by the certified monitoring well driller on the Uniform Kentucky Well Maintenance and Plugging Record to the cabinet and the monitoring well owner within sixty (60) days from the date abandoned.

Section 7. Materials for Monitoring Wells and Temporary Monitoring Wells. (1) Well casing and screens.

(a) Monitoring well casing and screens shall:

1. Be constructed of materials determined on a site-specific basis to ensure that the integrity of the material shall not be affected by contaminants or introduce contaminants to the groundwater;

2. Be resistant to chemical and microbiological corrosion and degradation;

3. Be able to withstand the physical forces acting upon them during and following their installation, and during their use, including force:

a. Due to suspension in the borehole, grouting, development, purging, pumping, sampling; and

- b. Exerted on the well casing and screens by the surrounding geologic materials; and
- 4. Have a minimum inside diameter of two (2) inches except for direct push and temporary wells.
  - (b) Used, damaged, or contaminated well casing or screens shall not be installed.
  - (2) Joints and couplings.
    - (a)1. All joints and couplings shall be a threaded flush joint design.
    - 2. All joints shall be watertight.
  - (b) The monitoring well casing shall extend a minimum of two and one half (2 1/2) feet above ground surface, except as established in Section 4 of this administrative regulation.
  - (c)1. A minimum annular space of two (2) inches shall be maintained between the borehole wall and the outside diameter of the monitoring well casing.
  - 2. In a multi-cased monitoring well the annulus between the well casings shall be a minimum of two (2) inches.
  - (d) Centralizers shall be installed:
    - 1. In monitoring wells greater than fifty (50) feet in depth; and
    - 2. At a minimum of ten (10) foot intervals.
  - (3) Filter pack.
    - (a) The filter pack materials shall:
      - 1. Consist of clean, rounded to well-rounded, insoluble particles of quartz silica composition; and
      - 2. Be of a size that minimizes head losses through the filter pack and prevents sediment movement through the well screen into the well.
    - (b) The filter pack shall be placed:
      - 1.a. In the annulus in a manner that prevents bridging; and
      - b. Slowly and carefully by the free-fall method; or
      - 2. Using another method that ensures proper placement of the filter pack.
    - (c) The depth to the filter pack shall be continually monitored during installation.
    - (d)1. A minimum of six (6) inches of filter pack shall be placed below the bottom of the well screen.
    - 2. The filter pack shall extend at least two (2) feet above the top of the well screen.
  - (e) Prepacked well screens may be used if the filter-pack material, filter-pack grain size, and the screen slots are properly sized for the monitoring zones.
  - (4) Sealing materials.
    - (a) Only potable water shall be used in mixing sealing materials used in the construction or abandonment of monitoring wells.
    - (b) The sealing material shall be placed in the annulus by a grout pipe, starting at the top of the bentonite seal to within three (3) feet of the ground surface.
    - (c) Side-discharge grout pipes shall be used if sealing the annulus for wells that are 100 feet deep or greater.
    - (d) The concrete surface pad or surface casing shall not be installed until the sealing materials placed in the annulus have settled and cured.
  - (e) Bentonite seal.
    - 1. The bentonite seal shall:
      - a. Consist of high solids sodium bentonite pellets with a minimum of thirty (30) percent solids; and
      - b. Be placed in the annulus by a method that ensures the prevention of bridging.
    - 2.a. The depth to the bentonite seal shall be continually monitored during installation.
    - b. The bentonite seal shall extend a minimum of two (2) feet above the top of the filter pack.

3.a. Hydration time of the bentonite seal shall be according to the manufacturer's specifications.

b. Only potable water shall be used as the hydration medium.

c. The surface opening and the annulus shall be protected during the hydration period to prevent material from falling into the borehole.

(f) Annular seal.

1. The annular seal shall be installed in a manner that prevents the migration of contaminants or pollutants along the monitoring well annulus into the well.

2. The sealing material shall be placed so that pollutants cannot migrate through the annulus.

3. The sealing materials shall not have a harmful effect on the well casings or screens or damage the surface completion of the well.

#### Section 8. Surface Completion. (1) Surface casing.

(a) Monitoring wells completed with the well casing extending above ground surface shall be constructed with a steel, anodized aluminum, or PVC outer protective surface casing with a locking cap.

(b) A water tight well cap shall be installed on the well casing.

(c) The well casing shall be cut in a manner so that the locking cap shall install properly and provide a waterproof seal.

(d) The outer protective surface casing shall:

1. Have a minimum of two (2) inches of clearance between the inside diameter of the outer protective casing and the outside diameter of the well casing;

2. Extend a minimum of one (1) inch and a maximum of twelve (12) inches above the inner well casing;

3. a. Be installed by pouring a concrete slurry mix into the borehole from the top of the annular seal to the ground surface; and

b. Then be pushed into the wet concrete slurry a minimum of two (2) feet below the ground surface;

4. a. Have a minimum of two (2) weep holes for drainage.

b. The weep holes shall be a minimum diameter of one-quarter (1/4) inch and shall be located directly above the top of the concrete surface pad; and

5. Bear the Kentucky Water Well Tag with the water well number.

(2) Bumper guards.

(a) Monitoring wells extending above ground surface shall have:

1. Four (4) protective bumper guards consisting of steel pipes a minimum of three (3) inches in diameter; and

2. A minimum of five (5) feet in length.

(b) The bumper guards shall:

1. Be installed to a minimum depth of two (2) feet below ground surface in a concrete footing;

2. Extend a minimum of three (3) feet above ground surface;

3. Be filled with concrete for additional strength if the bumper guards are steel pipe; and

4. Be painted a highly visible color.

(c) A modification to the bumper guard requirement shall be pre-approved by the cabinet according to the variance procedure established in Section 1(7) of this administrative regulation.

(3) Concrete surface pad.

(a) All monitoring wells shall have a concrete surface pad a minimum of six (6) inches thick with a minimum three (3) foot diameter or square pad centered on the well.

(b) The concrete surface pad shall slope away from the monitoring well in a manner as to prevent precipitation or contaminants from accumulating around the well.

Section 9. Well Development. (1) Newly installed monitoring wells shall be developed until the column of water in the well is free of visible sediment.

(2) The well-development protocol established in subsection (1) section shall not be used as a method for purging prior to water quality sampling.

Section 10. Repairs or modifications to the well casing shall be reported to the cabinet by the certified monitoring well driller on the Uniform Kentucky Well Maintenance and Plugging Record.

Section 11. Monitoring Well Abandonment. (1) General requirements.

(a) A monitoring well that has been damaged or is otherwise unsuitable for use as a monitoring well shall be abandoned within thirty (30) days from the:

1. Last sampling date; or
2. Date it is determined that the well is no longer suitable for its intended use.

(b) Monitoring wells shall be abandoned in a manner that prevents the migration of:

1. Surface water or contaminants to the subsurface; and
2. Contaminants among water bearing zones.

(c) A Division of Waste Management program that permits or regulates the facility at which a monitoring well is to be abandoned shall be notified by the certified monitoring well driller a minimum of ten (10) working days prior to abandonment of each monitoring well.

(d) A temporary monitoring well shall be abandoned within seventy-two (72) hours after installation.

(e) A record of the monitoring well abandonment shall be submitted to the cabinet by the certified monitoring well driller on the Uniform Kentucky Well Maintenance and Plugging Record within sixty (60) days from the date abandoned.

(2) Abandonment methods and sealing materials for all types of monitoring wells.

(a) The surface casing, monitoring well casing, well screen, filter pack, bentonite seal, and cement shall be removed.

(b) The borehole shall be plugged with sealing material by grout-pipe method or by pressure injection from the bottom of the boring to within three (3) feet of the top of the borehole, except as established in paragraph (c) of this subsection.

(c) The borehole may be plugged using the gravitational displacement, or free-flow method to a maximum depth of fifty (50) feet with bentonite:

1. With a minimum particle size of three-eighths (3/8) inch; and
2. Used according to the manufacturer's specifications.

(d) The top two (2) feet of the borehole shall be filled with materials consistent with the surrounding ground surface.

(e) If the well casing cannot be removed, an alternate method of abandonment may be used if approved in advance by the cabinet in accordance with the variance process established in Section 1(7) of this administrative regulation.

Section 12. Division of Waste Management Program Requirements. (1) Prior to the installation or abandonment of a monitoring well at a facility regulated by the cabinet, all monitoring



well construction designs and all monitoring-well materials shall be pre-approved by the cabinet in accordance with the requirements established in KRS 224.1-400, 224.1-405, 224.43-010 through 224.43-815, 224.46-012 through 224.46-870, and 224.60-100 through 224.60-160.

(2) The cabinet shall be notified at least ten (10) working days prior to a monitoring well construction, modification, or abandonment so that a cabinet representative may be present at the construction, modification, or abandonment.

Section 13. Documents Incorporated by Reference. (1) The following material is incorporated by reference:

(a) "Uniform Kentucky Well Construction Record", DEP No. DOW6010, July 2019;

(b) "Uniform Kentucky Well Maintenance and Plugging Record", DEP No. DOW6040, July 2019; and

(c) "Kentucky Monitoring Well Variance Request", DEP No. DOW6090, July 2019.

(2) This material may be inspected, copied, or obtained, subject to applicable copyright law, at the Division of Water, 300 Sower Boulevard, Frankfort, Kentucky 40601, Monday through Friday, 8 a.m. to 4:30 p.m. This material is also available on the Division of Water Web site, <https://eec.ky.gov/Environmental-Protection/Water/GW/Pages/GWDrillers.aspx>. (35 Ky.R. 605; 811; eff. 10-8-2008; TAm eff. 7-8-2016; Crt eff. 9-5-2018; 46 Ky.R. 645, 1481; eff. 1-3-2020.)